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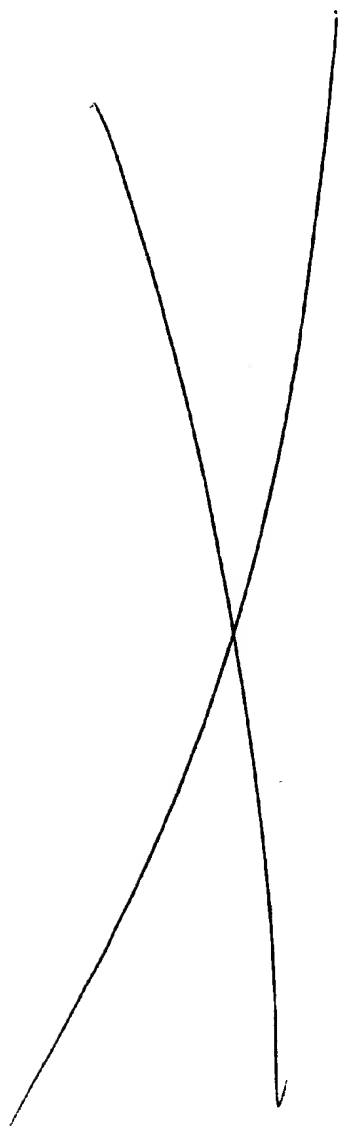
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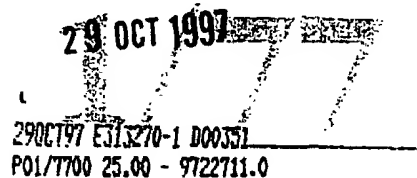
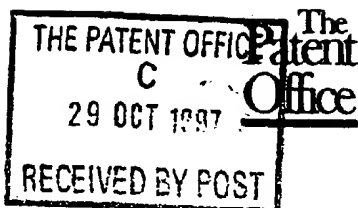
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9722711.0

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Cardiff Road
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1. Your reference

DC/5345

2. Patent application number

(The Patent Office will fill in this part)

3. Full name, address and postcode of the or of each applicant (underline all surnames)

McGILL, Shane Robert
107-109 High Street
Rochester
Kent ME1 1JS

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

04083259004

4. Title of the invention

Food Blending Apparatus

5. Name of your agent (if you have one)

Lewis & Taylor

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

5The Quadrant
Coventry CV1 2EL

Patents ADP number (if you know it)

711001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number
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Date of filing
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7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is not named as an applicant, or
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Patents Form 1/77

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Description 13

Claim(s) -

Abstract -

Drawing(s) 7 + 7

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11. I/We request the grant of a patent on the basis of this application.

Signature

Date

David R Cowan

28 October 1997

12. Name and daytime telephone number of person to contact in the United Kingdom
David R Cowan
01203 222756

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FOOD BLENDING APPARATUS

This invention relates to food blending apparatus and to a method of blending food within a container. The invention has particular application to milk shakes but can be used with other food products which need to be blended, particularly those which need to be dispensed ready for consumption in retail premises.

Hitherto milk shakes have been produced by manually placing ice cream, milk and flavouring into a blender jug into which a blender is inserted to produce the blended milk shake. The milk shake is then poured into a receptacle from which the customer consumes the product. The blender jug then has to be cleaned and sanitised for re-use. However, in the present fast food market there is a demand for a better system for producing milk shakes taking account of health regulations, labour costs, waste, product quality and the level of skill of the operator. Current milk shake systems provide for improved pasteurisation but such systems are more expensive and more complicated. Moreover some of such systems are limited in the flavours which can be produced.

An object of this invention is to provide food blending apparatus which overcomes problems with existing systems.

According to the invention food blending apparatus comprises a container for food product which container defines a space for receiving the food product, a sealing member for sealing the space within the container, and blending means having a rotatable blending element located within said space and contactable with food product within said space, and coupling means associated with the rotatable element and arranged to be releasably coupled to rotatable drive means outside said container whereby the rotatable element is rotated in use, the coupling means being carried by the container to be accessible from the outside of the container and the rotatable element being rotatably mounted on the container in sealing arrangement therewith.

The apparatus may have the sealing member formed as a lid over an opening into the container by which food product is introduced into the container and through which, or a part of which, food product is accessed from the container.

The rotatable element and the associated coupling means may be located on the lid or at the base of the container remote from the lid. When the rotatable element is in the lid, the container is usually inverted for engagement with the drive means.

If the rotatable element is located in the base of the container, the container is usually located in an upright position during engagement of the drive means.

The drive means is conveniently incorporated into a support for the container on which the container is located during blending of product within the container, the support incorporating the drive means and its associated prime mover. The support may be located within a refrigerated cabinet and may include means for feeding containers to a blending position which can be initiated by coin freed means for self service.

The rotatable element is arranged to cause product in the container to be blended upon rotation thereof and is conveniently located centrally of the container and has outwardly directed portions extending from the axis of rotation.

The container sealing member may be removably located in sealing engagement with the opening at one end of the container and the sealing member may have a region which is openable to access the contents of the container after blending. Alternatively the sealing member may be removable after blending to access the contents.

Conveniently the container is in the form of a circular section vessel which may taper from one end towards the other in the manner of a beaker or cup.

The components of the container, its sealing member and the rotatable blending element are conveniently of plastics material so that these components may be disposed of after the food

product has been consumed. Moreover the container may be supplied for use containing food product to be blended. Thus this enables pre-filled containers to be supplied from a source, such as a factory, already filled with product ready for use by a retail outlet in a variety of food compositions and flavours, thus obviating the need for the retail outlet to store product for filling into the containers. In addition, due to the nature of the apparatus, food product cannot come into contact with associated apparatus before and during blending. Nevertheless the blended product is readily accessible by the user. Hygiene problems are overcome by this approach whilst still giving the opportunity for a wide range of products to be sold.

The filled containers may be supplied with components of the product layered within the container in horizontal or vertical layers, the blending process bringing about the desired blended product. If desired it is also possible for the product to be aerated within the container in addition to a blending process. As a further option the containers may be kept cold and ice may be present or introduced into the container to be incorporated into the blended product.

By the provision of containers filled with product and incorporating as part of the container a rotatable blending element full blending is obtained and there is no sanitising or hygiene problem. The container assembly can be made cost effective by the use of plastics components even though the container may only be used for one serving of product.

Further features of the invention will appear from the following description of various embodiments of the invention given by way of example only and with reference to the drawings, in which:

Fig 1 shows a vertical section through a food blending container for use with food blending apparatus, the lid part of the container being shown disassembled in the upper part of Fig 1,

Fig 2 shows the container associated with a support and drive arranged for a blending process,

Fig 3 is a scrap vertical section showing an optional feature of the container of Fig 1,

Fig 4 is a vertical cross section through blending apparatus with a container in another embodiment,

Fig 5 is a plan view of a closure for the container of Fig 6,

Fig 6 is a vertical section showing the closure of Fig 5 on the container of Fig 4,

Fig 7 is a vertical section through apparatus for feeding containers, according to Fig 4 to blending stations,

Figs 8 and 9 show vertical cross-sections through a container showing different product locations prior to blending, and

Fig 10 shows a vertical and a horizontal cross-section through a container showing further product locations within the container prior to blending.

Referring to the drawings and firstly to Fig 1 there is shown a container for use in blending apparatus which comprises a body portion 3 consisting of a plastics member in the shape of a beaker having a base 3A, upwardly diverging, circular cross-section side walls 3B and an upper edge 3C of the container 3 with an outwardly directed lip.

The container body 3 is provided with a closure member 2 constituting a lid arranged to fit over the upper end of the body 3 and to close the opening at the top of the body. The lid 2 is generally circular having an outer portion 2A which fits over the upper end 3C of the body 3 to be sealingly engaged over the opening. This may be by a clip arrangement, by heat sealing, or by any other suitable means for securing the lid 2 on the body 3.

At the centre of the lid 2 is formed a rotatable blending element or impeller 1 sealingly

carried on the lid 2 but for rotation relative thereto about the axis A of the container. The blending element 1 is retained on the lid by circular retaining portions 4 formed on the lid 2 which engage in corresponding circular grooves 4A formed in the member 1. The retaining portions 4 are formed on an upstanding, inverted L-shaped portion 4B of the lid 2 which extends around a central opening 2A formed in the lid 2. Other means may be used to obtain seals but which also permit relative rotation between the element 1 and its support.

The blending element 1 fits over the circular L-shaped member 4B by the provision of a correspondingly shaped portion of the element 1 which extends inwards over region 4C towards an integral impeller portion 4D which extends downwards into the body of the container and defines a hollow central portion 4E shaped to be engageable by drive means, to be described. At the lower end of the impeller portion 4D is formed an outwardly directed impeller member 4F which, in this case, is a downwardly inclined and outwardly directed shaped member. In practice the impeller member 4F is shaped to give the desired blending action to product within the product space X within the assembled container according to known practice. Thus, for example, the impeller member may have inclined surfaces to help to generate a vortex within the product in space X, or there may be individual arms extending outwardly from the axis with or without inclined surfaces. Alternatively the impeller member may give a gentle mixing action, in which case the impeller may comprise a disc.

A removable diaphragm 6 may be provided on the rotatable member 1 for releasable location closing the opening 4E. The purpose of the diaphragm 6 is to seal the container during transit, the diaphragm 6 being removable prior to placing the assembled container with product on associated apparatus whereby the product within the container is blended. The diaphragm may be heat sealed to the lid 2 and, instead of removable, it may be pierced by drive means 8 for rotating the element 1.

As will be seen from Fig 1 the lid 2 may be formed with a sealed opening through which a straw 5 may be inserted, after blending, to enable the product to be drawn out of the container with the straw. The straw 5 may be inserted through a weakened area of the lid 2 to gain access to the product, in known manner. Alternatively access for the straw may be through

an opening covered by a removable diaphragm or through a moulded tube of which a closed end may be removed for access by the straw. Alternatively the lid 2, together with the associated rotatable blending element 1 is removable, after blending, to gain access to the product within the container body 3 after blending.

Referring now to Fig 2, the container of Fig 1, after assembly and with product within the container, is inverted, as shown, to effect a blending action. In Fig 2 there is shown a housing 7 which acts as a support for the container and which houses a drive motor (not shown) from which is directed a drive shaft 8. A stop-start switch 9 is located on the housing 7 to actuate the drive motor and drive shaft 8, or the motor may be started by a proximity switch operated by location of the container on the support.

The drive shaft 8 is arranged to drivingly engage the opening 4E of the rotatable blending element 1 so that as the drive shaft 8 is rotated it rotates the element 1 to blend product within the container. The drive shaft 8 is located to extend from a recessed portion 10 of the housing 7, the recessed portion receiving the rotatable element 1 for rotation with the drive shaft 8 and the upper surface of the lid 2 being supported on the upper surface of the housing 7 around the recess 10. The container is retained on the housing 7 by a locking tube 11 which surrounds the container body 3 and moves reciprocally to engage with the lip 3C of the body 3 during a blending operation.

Thus it will be seen that the container is held in position by the tube 11 with the container seated on the housing 7, the product is blended by operation of the drive shaft 8 to rotate the element 1 and cause product within the space X to be formed into a vortex to mix, aerate and blend the different components of the product thereby forming a blended product in the desired manner.

After the product is blended the tube 11 is withdrawn from engagement with the container and to permit the container to be removed from the housing 7 ready for use and consumption.

Referring to Fig 3, there is shown an optional feature of the container of Figs 1 and 2. In this

arrangement a portion of the lid 2 between the member 1 and the edge of the lid is formed with a circular opening 12 from which inwardly extends a depression 13 at the lower, inward end of which is formed a closure 14 which includes weakened portions as seen at 15 in the scrap view A of Fig 3. The opening 12 may be sealed by a diaphragm 16 over the upper end of the opening, the diaphragm being removable by peeling off or otherwise.

The purpose of the opening 12 in the lid 2 is to give access into the container for a nozzle through which pressurised gas may be injected into the product. The nozzle (not shown) may be inserted through the base of the opening 12 breaking the frangible or weakened areas 15 in said base of the container or by the base being open and being normally sealed with a diaphragm at its upper end. By this means contamination of the nozzle is avoided or minimised. Alternatively the nozzle can seal with the side walls of the depression 13, the pressure of the gas breaking open the portion 14 by breaking through the weakened lines 15. The diaphragm 16 provides added security to prevent product escaping through the opening 12.

It will be seen that the opening 12 is offset from the centre of the container but, if desired, the opening may be central with the impeller 1 offset to one side of the axis A.

Referring now to Fig 4, there is shown blending apparatus similar to that of the previous embodiment except that in this case the rotatable blending element or impeller 1 is located in the base 3A of the container body 3. Thus the container comprises a container body 3 of similar shape to that previously described with an outwardly directed lip 3C and a base 3A. A rotatable blending element 1 is located centrally of the base 3A and is supported sealingly in relation to the base for rotation about the axis A. The element 1 has a central body 1A having a lower opening shaped to drivingly receive a shaft 8. The shaft 8 is drivingly connected to a drive motor (not shown) located in a housing 7.

The element 1 includes upwardly inclined and outwardly directed impeller elements 1B which are arranged to cause product within the container to be blended by the creation of a vortex of product within the container.

The body 1A is sealingly located for rotation relative to walls 17 formed integrally with the base 3A and extending upwardly from a dished portion 18 in which is formed an opening for gaining access to the element 1 by the draft shaft 8. Suitable seals (not shown) are provided for enabling the element 1 to rotate within the walls 17 whilst maintaining a seal against the flow of product from the container.

In Fig 4 the container is shown in a blending position in the housing 7, the base 3A being seated on the housing. The sides of the container body are, as shown, located within a correspondingly shaped receiving member 20.

As shown in Fig 6 the upper end of the container of Fig 4 may be sealed by a diaphragm 21 which is sealingly secured to the upper end of the container body and which may be peeled off by use of a tab 22 extending to the side of the container which, when not in use, may be laid down the side of the container. After removal of the diaphragm 21 a lid (not shown) may be applied to the container. Alternatively the diaphragm may remain in place and a lid with a protrusion to puncture the diaphragm may be applied to provide an inlet for a straw.

With the arrangement described in relation to Figs 4, 5 and 6 the location of the blending element 1 in the base of the container 3 may not always lend itself to accessing product within the container, especially when a spoon is to be used. In such a case the container version when the rotatable element is in the lid may be preferred, as in the embodiment of Fig 1.

Product to be blended in the container can take a variety of forms but generally consists of two or more components for example milk, flavouring, ice etc. These components may be pre-filled into the body 3 of the container at a central location or can be filled at the place of consumption. In either case the component products may be layered as shown in Figs 8, 9 and 10. In Fig 8 a two component product is illustrated in which one component is located in the lower part of the body 3 and the other component in the upper part. In Fig 9 there is a similar arrangement except that a further component is layered onto the top of the container, for example a flavour component. In the base of the container is located another layer of

component, for example particulates such as nuts. Alternatively there may be a single product in which ice may have formed as crystals within the product. Blending can be used to break down the crystals into small ice particles. Moreover blending may be of a single product of which a blended consistency is required.

In Fig 10 is shown another arrangement in which components are located within the container in vertical layers. This may be by filling the container from a dispenser in such a component array.

Referring now to Fig 7 there is shown a blending apparatus, in this case incorporating containers of the kind shown in Figs 4, 5 and 6. In this apparatus there is an outer housing 25 in the base of which is located a plurality of side by side motor housings 7. In an upper storage housing 26 is located vertical stacks of filled containers for access by the operator. Containers, filled with product, from the housing 26 are released from the stacks for location on the motor housing 7 for blending purposes and each of the stacks may have containers with different product formulations so that a choice of, in this case, four different product formulations may be available for blending and dispensing.

There are various other aspects of this invention which can be adopted amongst which is that the operation of the blending action can be timed to provide a blending action for a predetermined period, and the operation of the locating means for the containers can also be timed to match the duration of blending.

Instead of the lid being removable for access to product, or the use of a straw to access product, the lid may have a portion which can be torn off to give access to the product. Moreover the lid may be removable to insert additives into the product prior to or after blending. For example if the apparatus were used for cocktails with an alcohol content the alcohol can be added before or after blending.

The containers may be filled with product and supplied to the user without the lid being fitted to the container and with a simple peel-off or tear-off cover. This allows the lid and

associated blending element to be fitted at the point of sale prior to blending. The blending elements may be constructed to allow the elements to be nested one inside the other to provide minimum volume during shipping and also to permit handling on automatic machinery.

The motor housing may have more than one drive shaft extending therefrom to permit several containers of product to be blended at the same time.

Instead of the arrangement of Fig 7 other automatic feed arrangements can be used for transporting containers from a refrigerator or freezer; the containers being moved into position onto static drive arrangements or, alternatively, the drive shafts may be mounted for movement along a linear or rotary path into position for the containers. Similarly the blended containers can be moved from a blending position along a conveyor or other transport means.

For efficient blending of the product its viscosity should allow a vortex to be formed inside the container whilst the product is being blended. When multiple components are included in the product they may be deep frozen for ease of distribution and storage. The product may then be placed in a tempering cabinet to warm the product up to the required blending temperature which may be between +5°C and -10°C dependent on the type of product. Once the blending temperature has been reached inside the tempering unit the components will have different consistency. Thus one element may be a liquid of low viscosity to act as the vortex catalyst during blending whilst another component contains other products and solids required in the final product. It may be advantageous to have the low viscosity component located in the container adjacent the impeller so that this liquid is in direct contact with the rotary blending element during the blending process. A single component may be fed into the container which separates into two or more components during storage and prior to a blending operation.

The components of the product can be extruded into the container, they may be fed by volume using piston and cylinders, or they may be fed by time lapse arrangements or by other means. A different filling station will usually be required for each component of the product

and air may be introduced into the product during the processing and filling stage. Similarly flavouring liquids can be included in the container as a separate component at the blending stage rather than introducing the flavoured components when the container is packed. Moreover particulate components may be added with low water content components to achieve the best conditions for blending.

Manual addition of components may also be conducted shortly before the blending operation and these components may be introduced through an opening in the container lid, for example the opening for the straw.

The material from which the container body 3, lid 2 and rotary element 1 are made will usually be plastics material, preferably being recyclable plastics. The various parts of the container may be made by injection or thermo moulding.

The motor driving the blending operation may have means for detecting the driving torque to ensure that the maximum torque applied does not exceed a pre-set level. This would ensure that where the product within the container is of the incorrect consistency (perhaps due to being the wrong temperature) blending cannot occur since the rotary element may be unable to withstand the forces involved. However the rotary element should be made of material which will not fracture but will distort if overload should occur. In addition the connection between the drive shaft and the rotary member may be such that, if excessive forces are applied, the opening in the rotary element will distort and allow freewheeling of the drive shaft. In addition the torque on the impeller or the current to the drive motor can be detected to determine the viscosity of the product during blending. This enables the motor to operate until the blended product reaches the desired viscosity.

The lid 2 may be heat sealed to the container body 3A to effect a permanent connection and in this case the lid may have a peel-back or tear-off portion to allow the product to be poured out of the container. This arrangement would be particularly appropriate for products such as frozen cocktails. Moreover the product may be consumed direct from the container.

The containers with at least part of the product contained therein may be kept at ambient temperatures without the need for refrigeration, especially if UHT products are used and the container is kept in a sterile condition. The container is kept in a sealed condition and the seal removed before use with the possible addition of low temperature or other product before dispensing. The low temperature product may be ice, cold liquid, or both and, after blending, a chilled or frozen dessert may be provided.

The apparatus of the invention may be used for cold or frozen products but can also be used for products at ambient or higher temperatures, such as hot chocolate, custard, sauces, mashed potato, tea, coffee etc. For this purpose the blending operation may be performed in an environment in which a microwave heating facility can operate.

Instead of the containers being filled remotely from the point of sale, filling can take place at or close to the point at which blending takes place. Freeze dry components, liquids and ice can be added at point of sale, the lid then being fitted and the product being blended and served to the customer. Feeding of components of product into the container may be manual, semi-automatic or fully automatic. When ice is used, such as crushed ice, the rotary member can break down the ice to a suitable size for the product. Moreover other cooling material such as frozen carbon dioxide, or carbon dioxide 'snow' produced from compressed carbon dioxide, can be inserted into the container for mixing and chilling the product during blending.

Compressed gas such as nitrogen may be used for chilling product and carbonated drinks may be produced by injecting carbon dioxide before or during blending of the product. A temperature detector may be employed to control the amount of chilling required.

In the blending apparatus described thus far it is intended that the container, its lid and the rotary member be disposable after blending and consumption. However a non-disposable, re-usable rotary element may be employed which is fitted to a lid which is applied to the container during blending. The rotary element would be easily removable from the drive for cleaning after use and may be formed of more durable material, such as metal components,

cleanable in dishwashing apparatus.

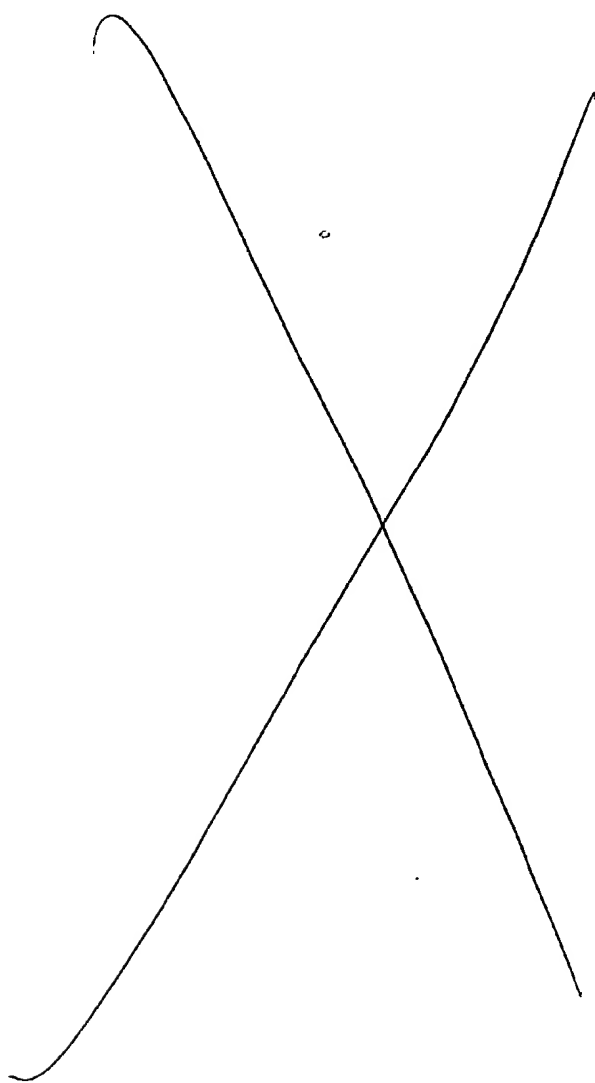
The motor for driving the rotary element may be powered by batteries, the usual electricity supply or by air motor, the latter being from a compressed air reservoir or otherwise.

If the product to be blended needs to be heated steam injection or hot water addition can be used.

If different sized containers are required common components can be employed for the lid and rotary element assembly with the container being of different depths. In this way the customer can be offered a full range of sizes without difficulty.

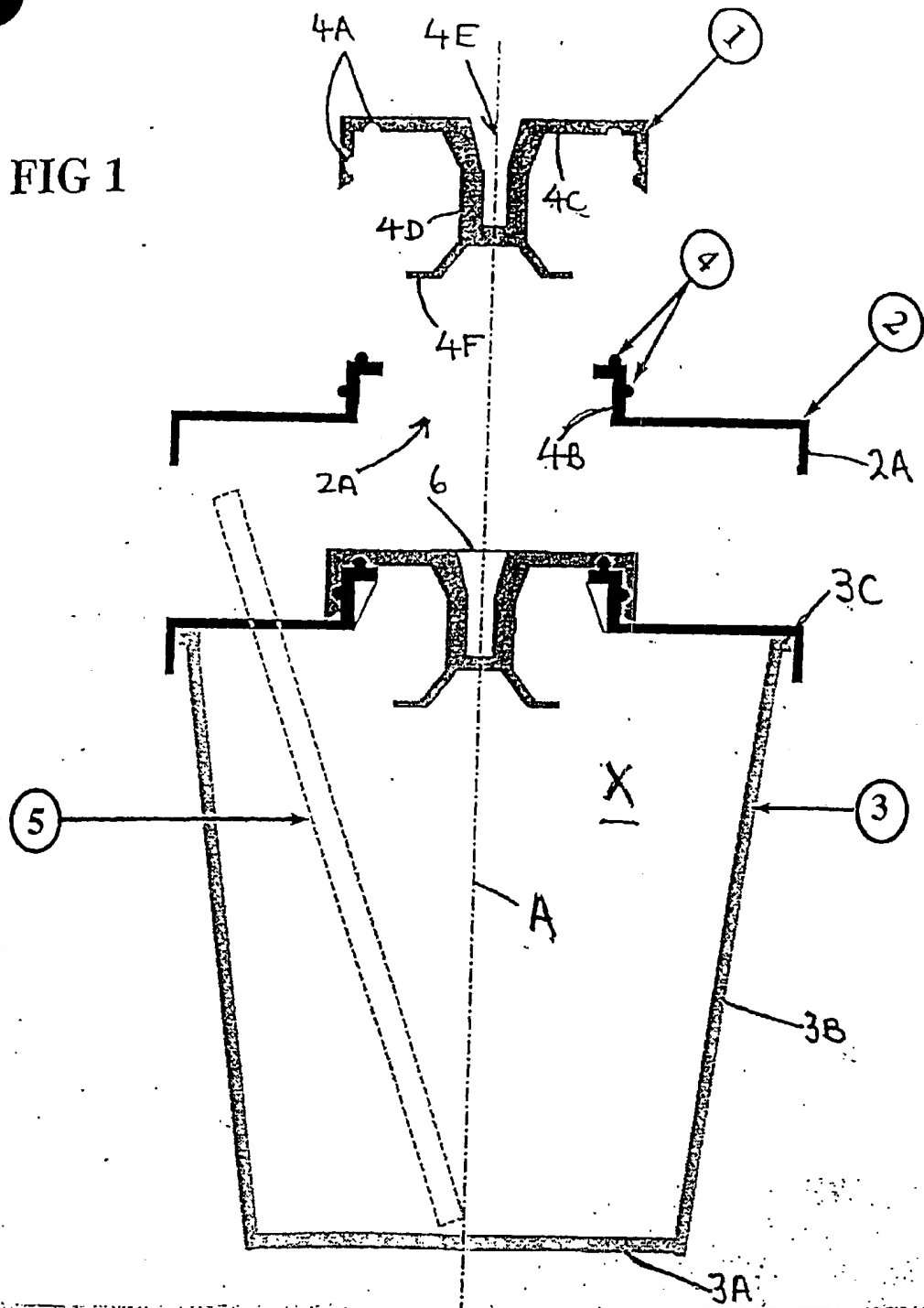
If it is desired to have chilled or partly frozen product, the containers with product may be kept at a low temperature such, for example, as to form ice crystals inside the container which are then blended with the product during the blending stage. Moreover by chilling or freezing the product close to the point of sale using suitable product components, the filled containers can be transported at normal ambient temperatures, then chilling or freezing the product upon arrival at point of sale.

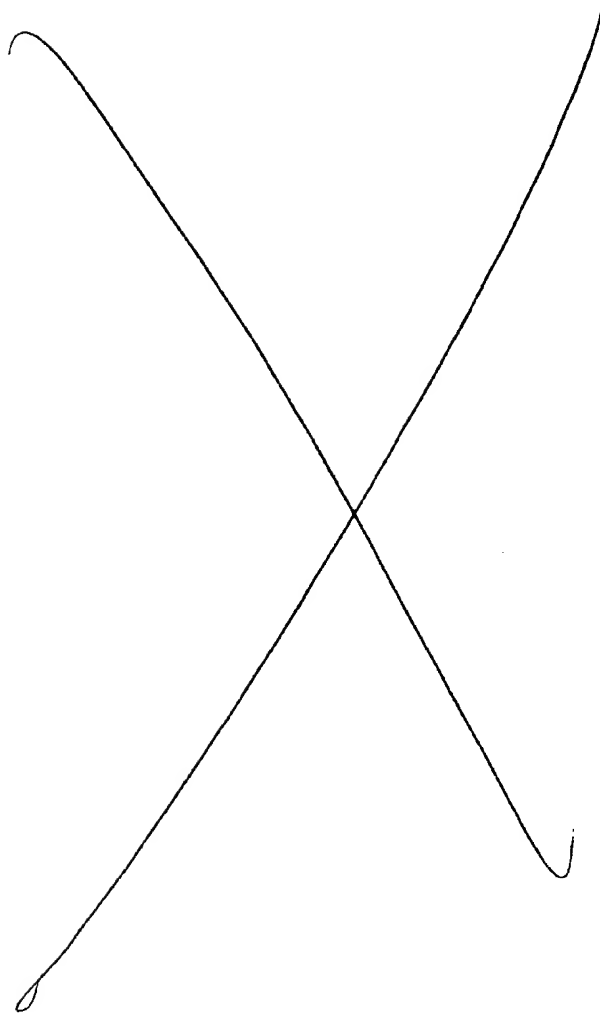
It will be seen that the blending apparatus offers the opportunity of dispensing blended products in a quick, safe and hygienic environment with the possibility of filling containers at a remote location or of introducing the product component just prior to blending. The arrangement is cost effective and efficient.



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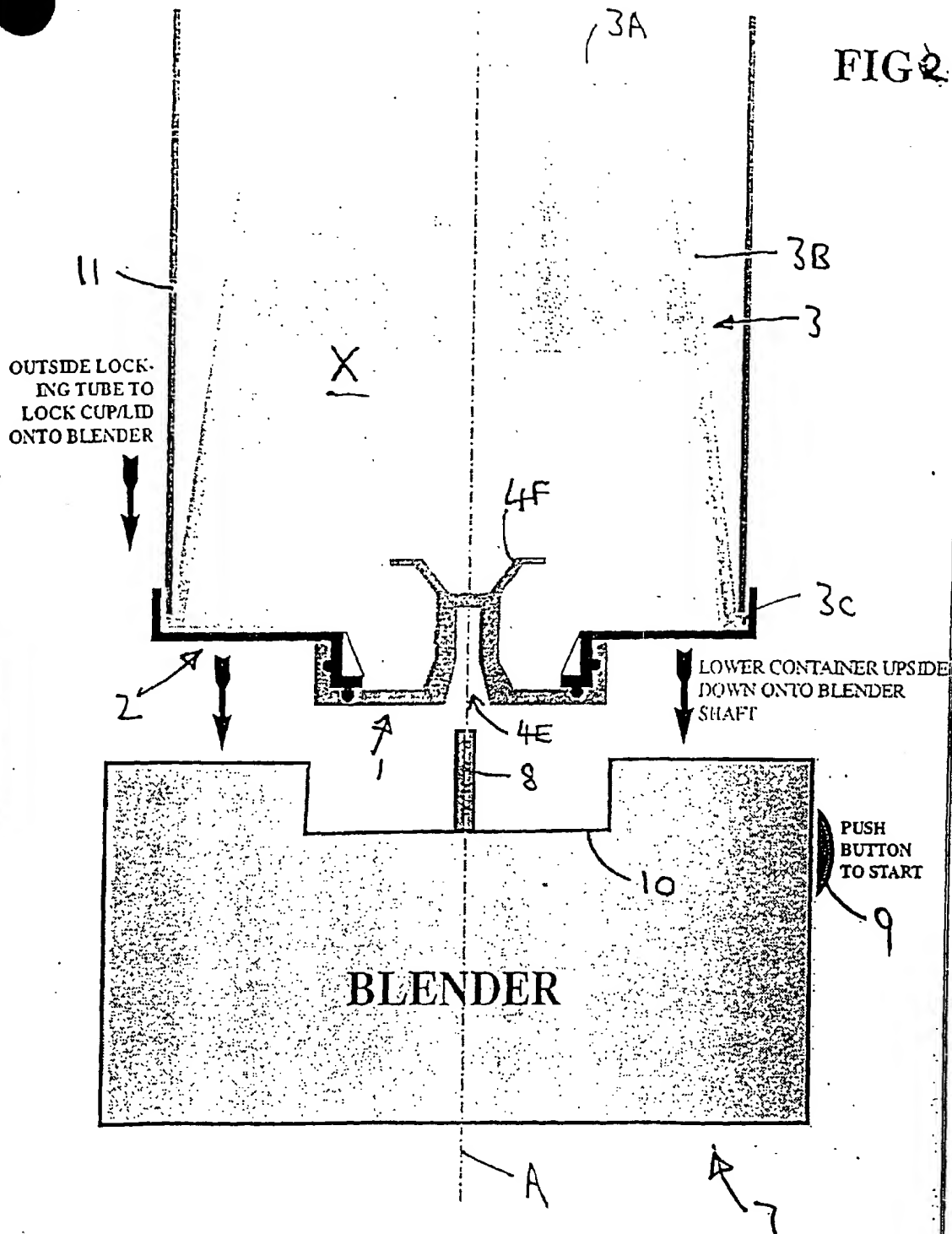
FIG 1

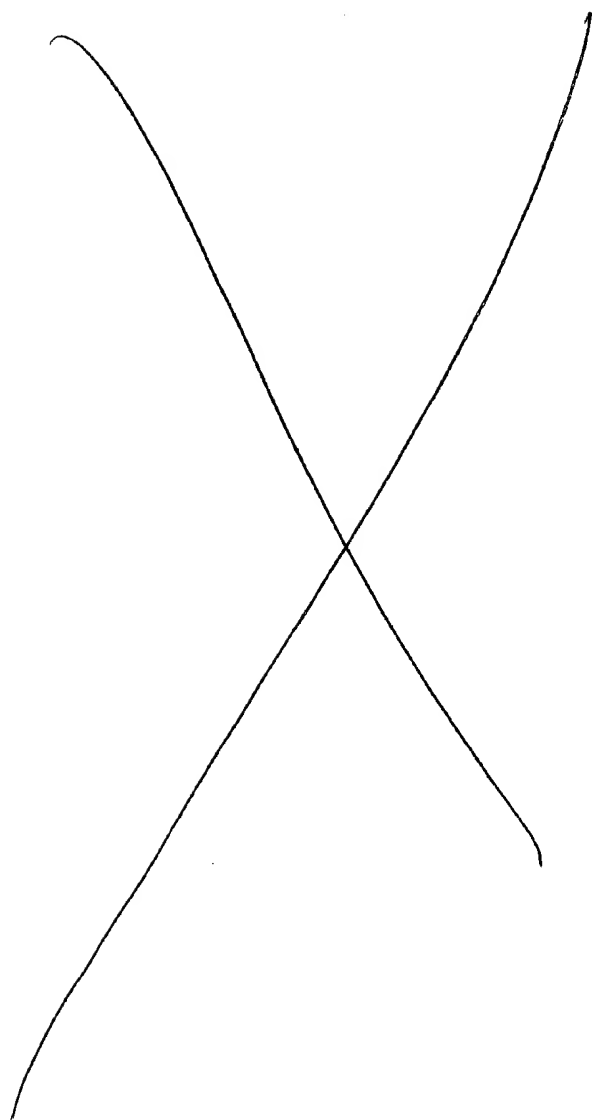


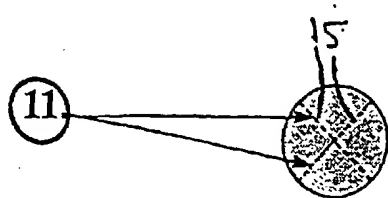


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FIG 2

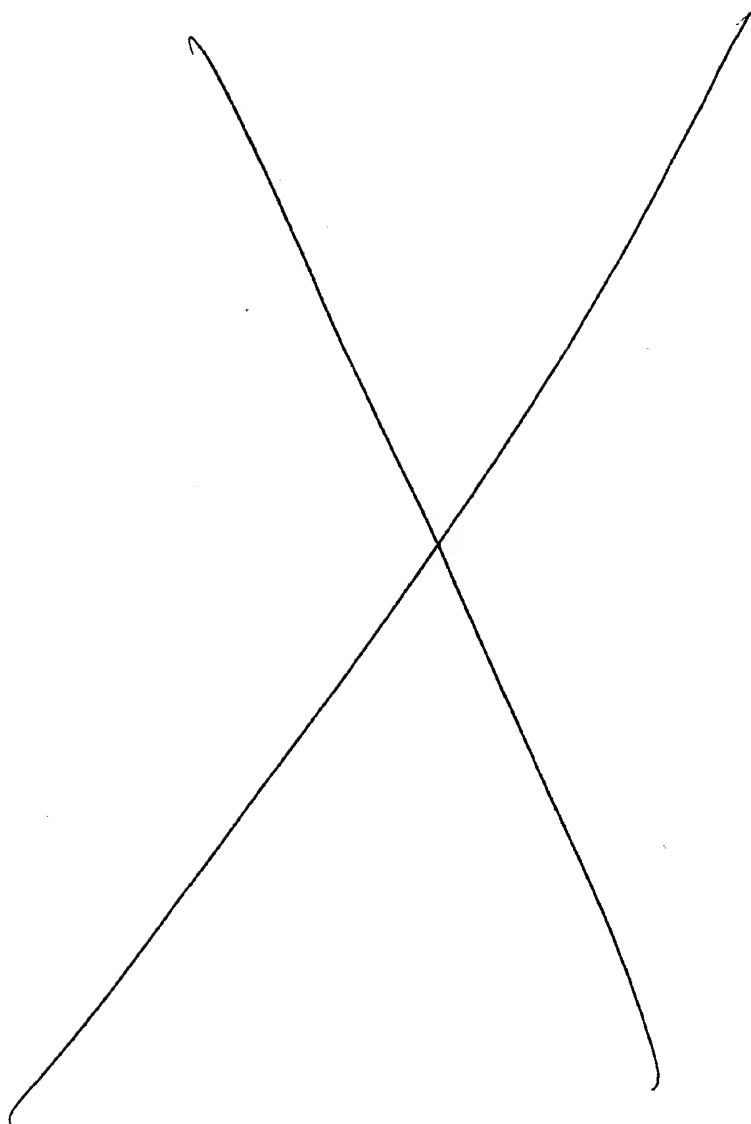






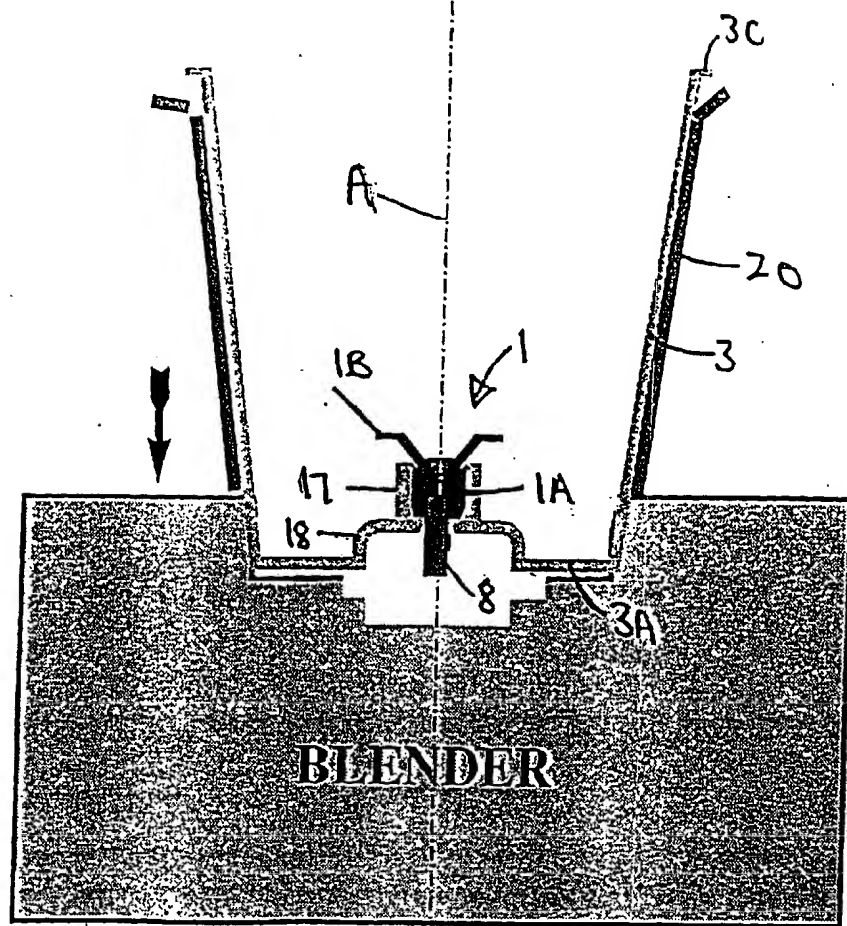
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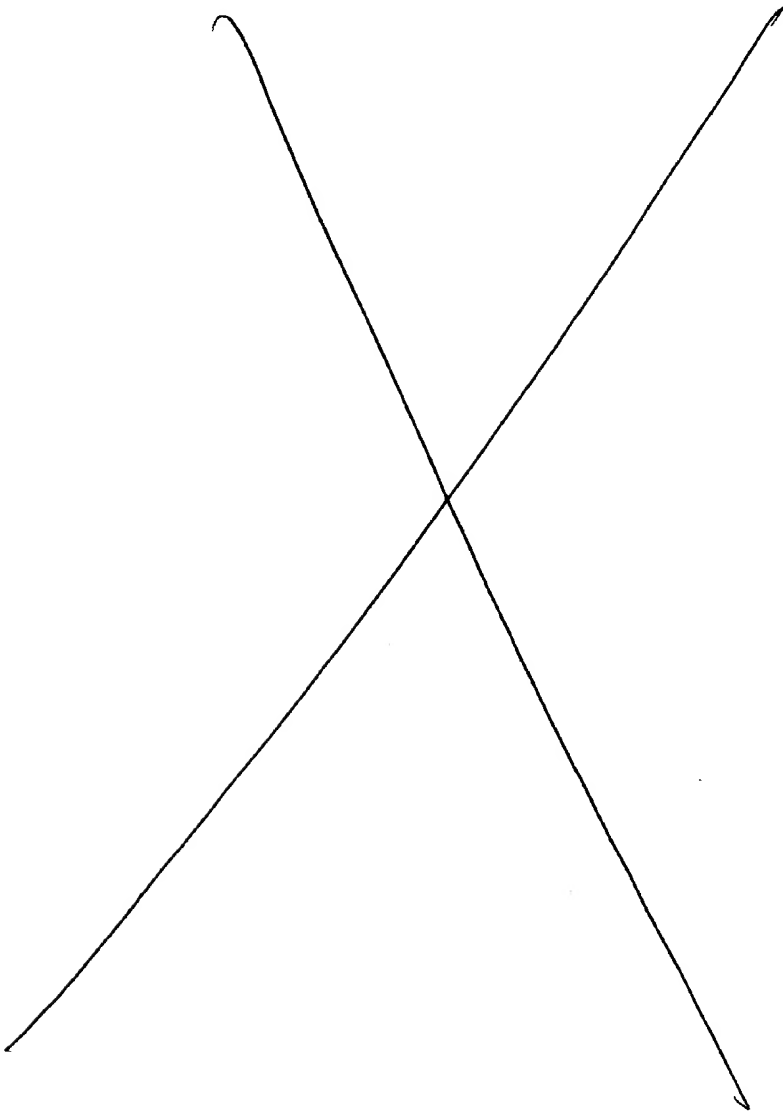
FIG 3



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FIG 4





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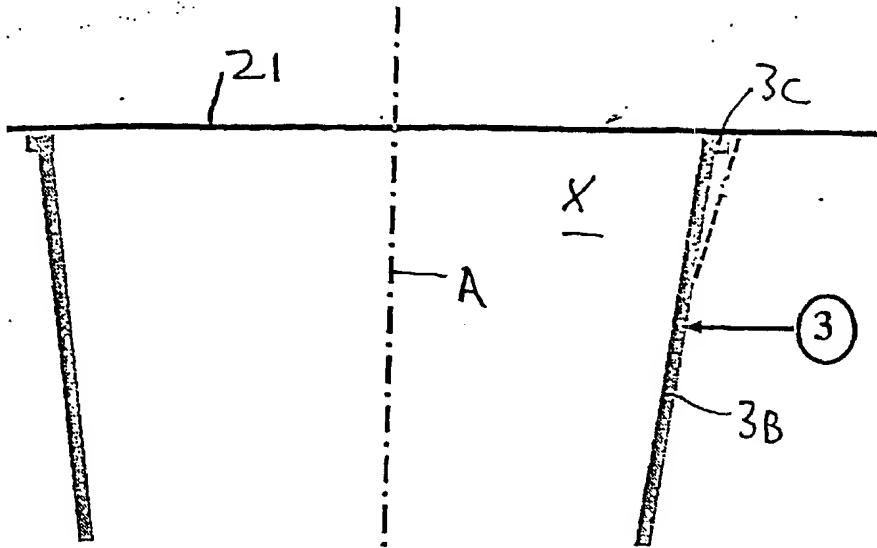


FIG 6

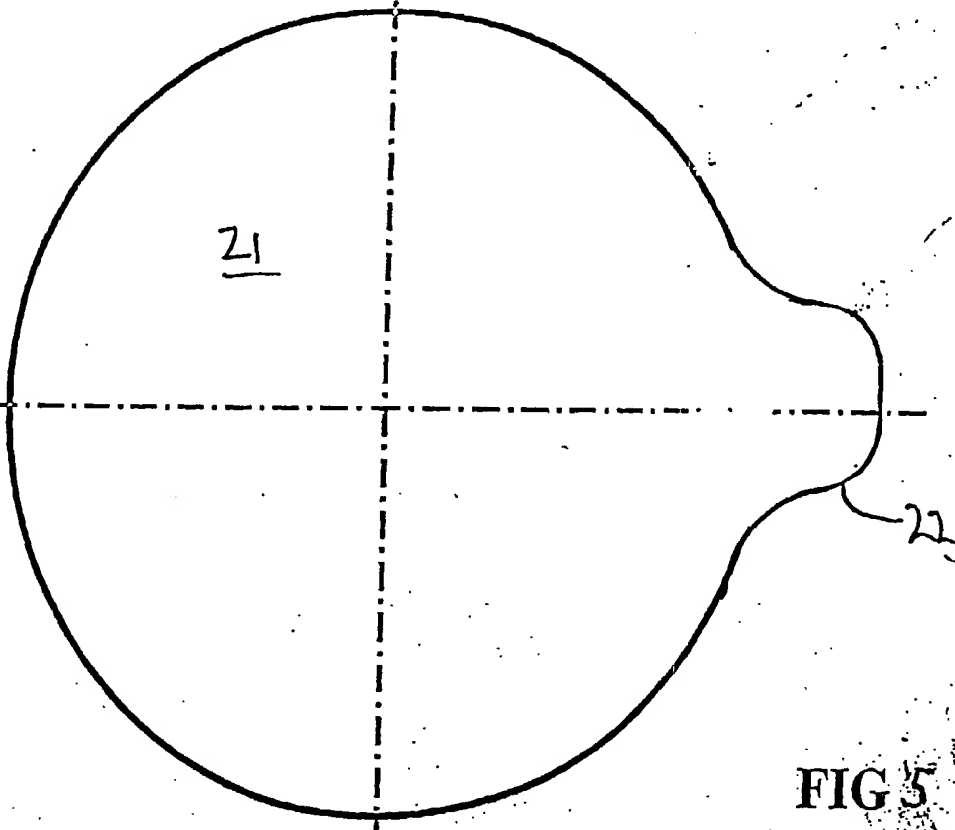
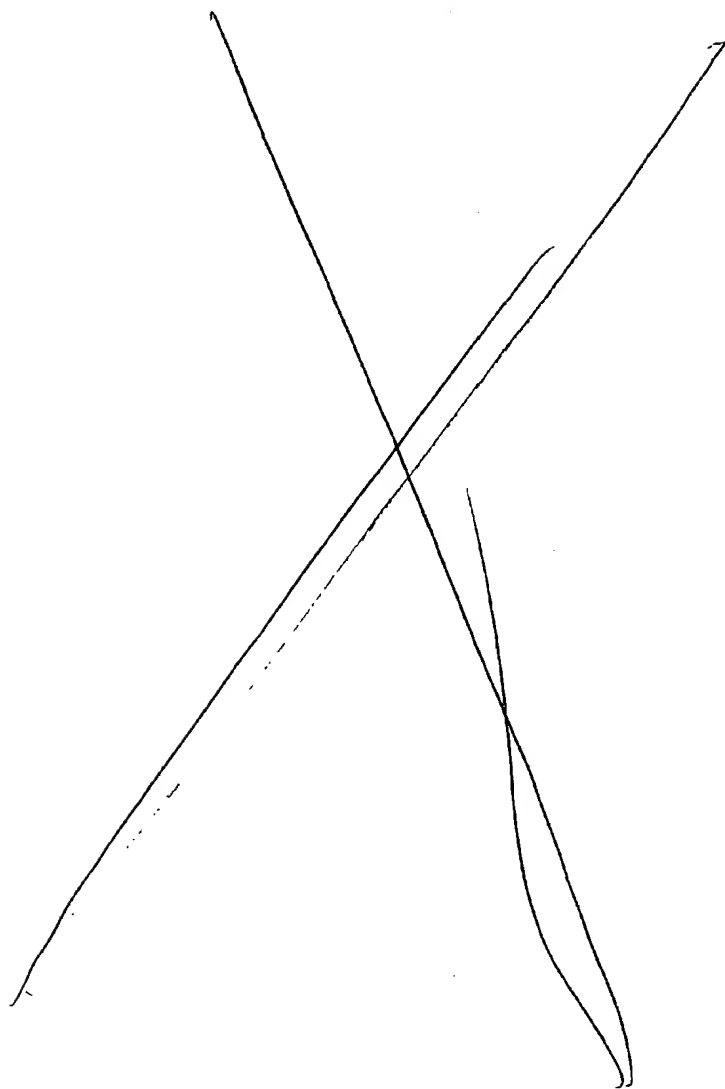


FIG 5



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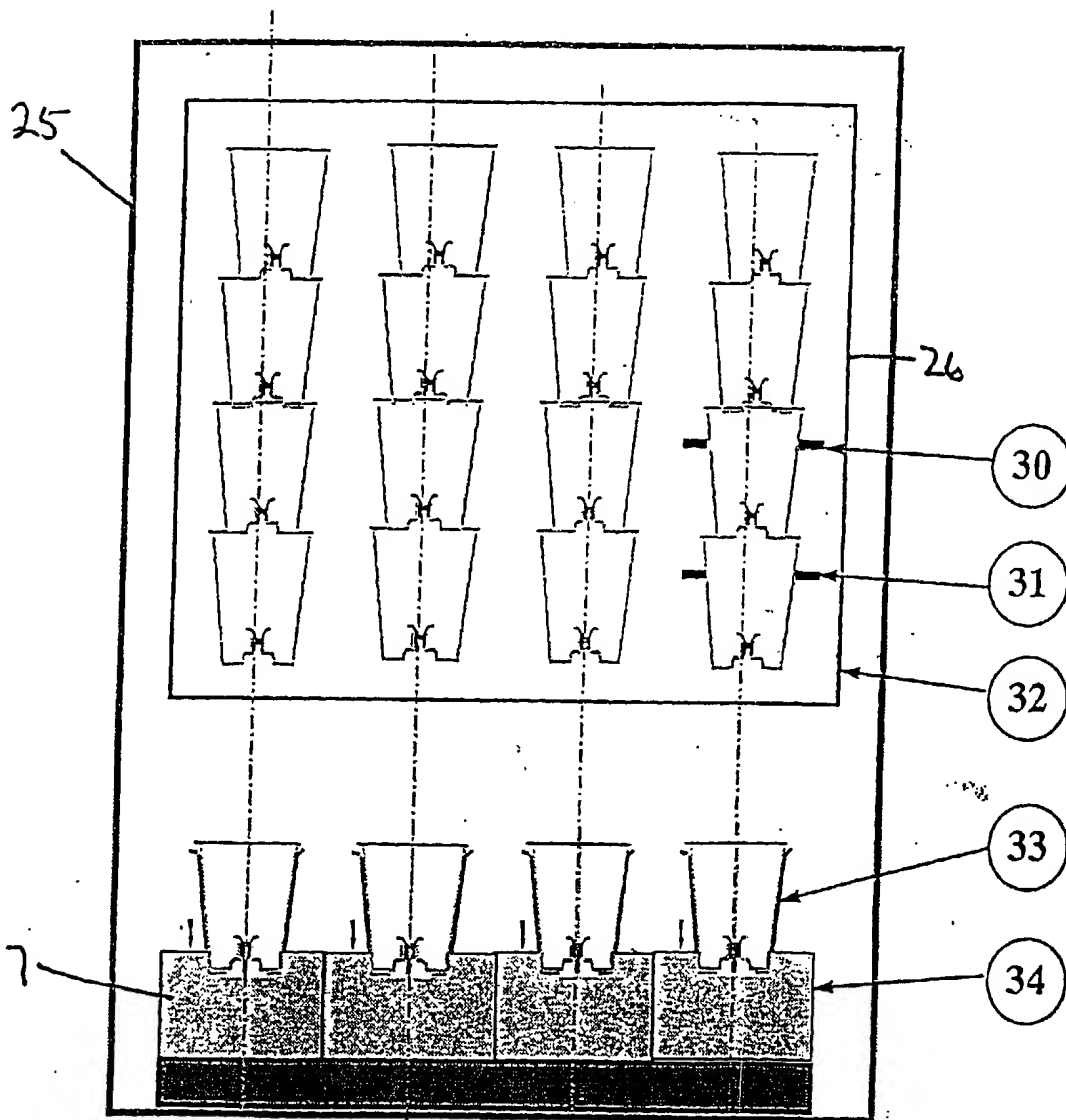
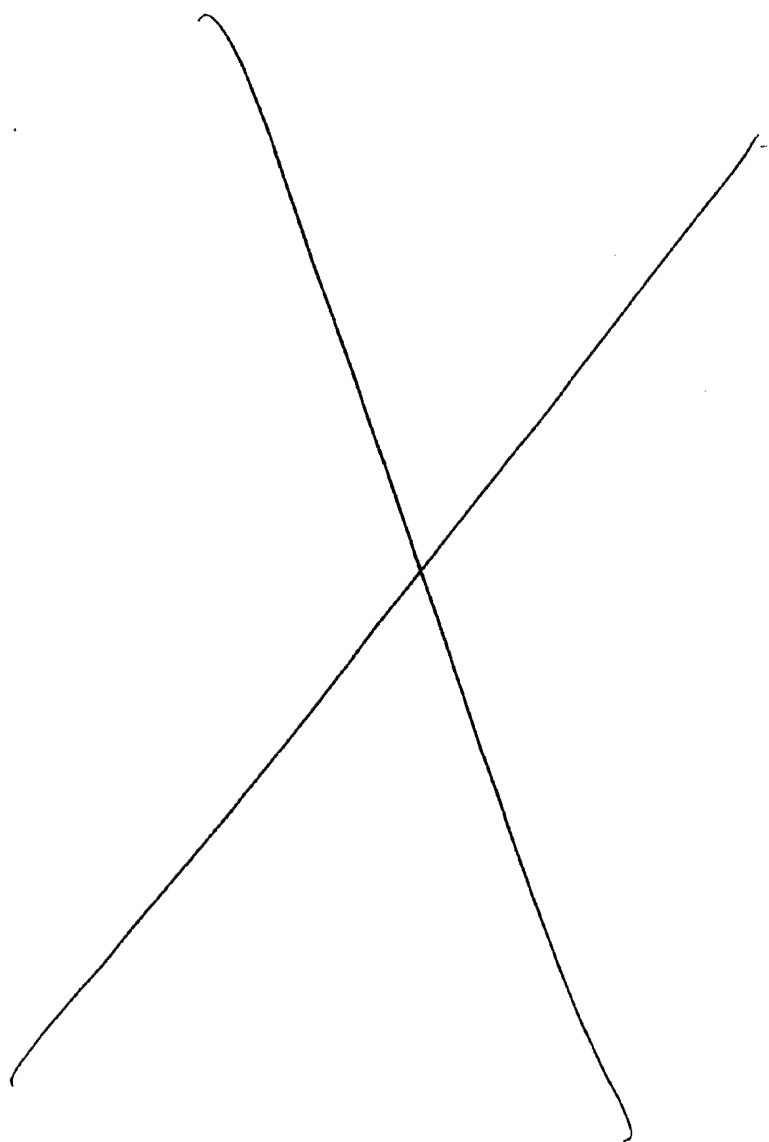
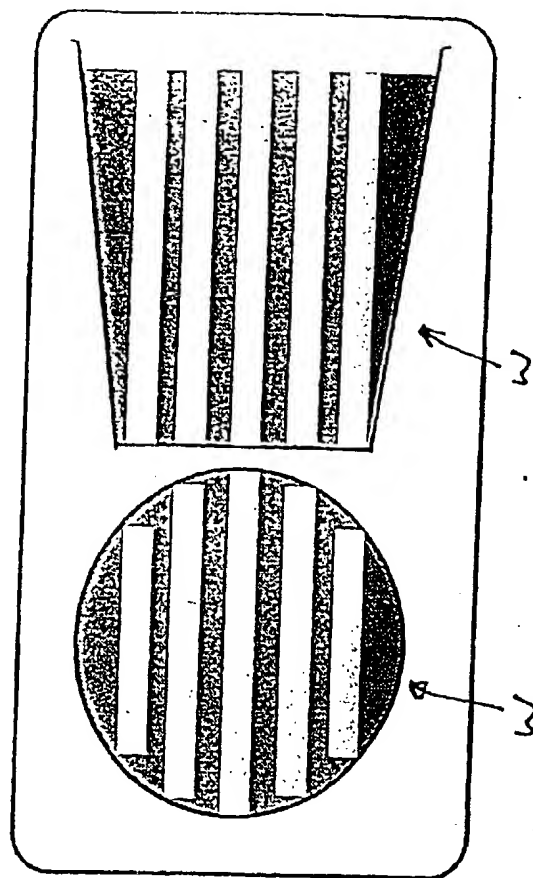
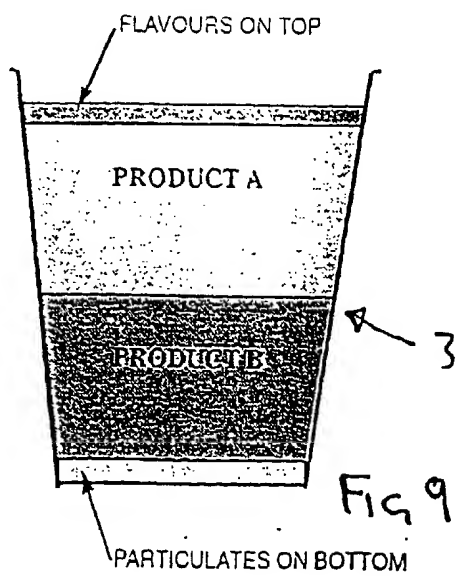
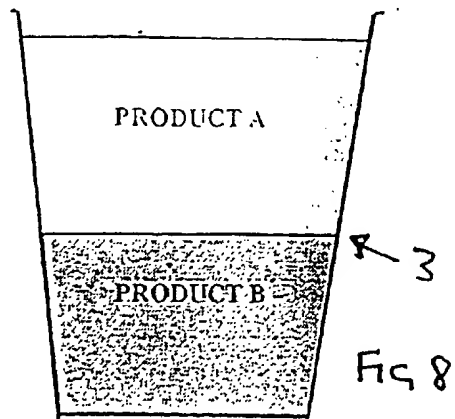


FIG 7





EXAMPLE OF TWO COMPONENTS PACKED VERTICALLY

FIG 10

PCT GB 9803193

27th October, 1998.

Lewis & Taylor.